

### District Heating—A Working Model

In the south of Sweden an innovative approach to simultaneously solving problems of community-waste management and energy needs is serving as an important model that should be applicable in many parts of the world. This is the district heating-plant in Eskjö (pronounced 'Eggsha'), a town of 10,000 people in the agricultural and forested county of Jönköping. The plant, operated by a municipal corporation (District Heating Board), utilizes fluidized bed combustion technology and has a capacity of thirty metric tons per hour. It burns about 300,000 tons per year of refuse (in two incinerators) and supplies hot-water heat to a substantial number of buildings in the community. It burns municipal wastes from towns in the area, as well as forest-industry processing wastes.

The modern plant has a simple design: A 28-hammers shredder reduces incoming materials to uniform small sizes. This 'feedstock' is then injected into an oil-fired fluidized-bed combustion unit that utilizes ordinary sand. From 60 to 90 kwh of electricity are required to grind each ton of feedstock material. The combustion heats circulating water, which leaves the plant at 170°C and travels *via* pipeline to buildings in the town, before returning to the plant for reheating.

The Eskjö plant requires relatively little maintenance. Dust control—dust can be a problem owing to the amount of sand utilized—is accomplished through use of standard Nomex filters; of the approximately 140 kg of sand and ash produced per hour, only about 180 mg

escapes with each cubic metre of flue-gas. As in all operations of this type, feedstock material can prove wearing to the plant's shredders. Hammers, which cost about US\$ 50 each, are replaced, on the average, every forty days.

In terms of economics, the Eskjö District Heating-Plant does not return a 'profit' in the ordinary sense of the word. For example, a typical recent breakdown of costs and income from the plant, in Swedish crowns (SK), is as follows (figures on a per ton basis):

Cost of operation:	SK 170
Income from heat sales:	SK 105

Support from local tax revenues is thus necessary for operation of the plant. There appears, however, to be general satisfaction with this economic arrangement. As one local citizen put it: 'In this way, we all benefit: the residents of Eskjö have reasonably-priced energy, a major waste problem for the region is solved, with much environmental contamination avoided, and there is less reliance for our country on non-renewable sources to meet energy needs.'

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### Calcutta's Wetlands for City Sewage Management and Re-use

The wetlands that lie beyond Calcutta's eastern boundary constitute a remarkable series of ecosystems that are vital to the health of the metropolitan area. For at least half-a-century, the sewage of Calcutta, rather than being treated chemically, has undergone a natural process of purification and has sustained extensive fisheries.

The ecological process linking sewage disposal and fish-farming is the focus of a research and monitoring project of the Department of Fisheries, Government of West Bengal. Dr Dhrubajyoti Ghosh, Consultant Ecologist, who heads up the project, estimates that about 20,000 fisher-folk gain employment from the fish-ponds that cover some 10,000 acres (4,050 ha) of the marshy, 'Salt Lakes' region lying east of Calcutta City. A wide variety of fishes—major carps, exotic carps, and *Talapia* spp.—are farmed, yearly production being some 6,000 tonnes on average (Ghosh, 1983).

Biologically, these lakes and pools act as highly efficient 'oxidation ponds', the aeration being augmented by the action of Water-hyacinths (*Eichhornia crassipes*). The research project is monitoring the quality of the water and checking the fish for possible contamination.

Although the actual biological processes are not yet fully understood, this set of natural ecosystems appear to work very well. The sewage flowing in from the sewage canals has not been found to contain any significant level of heavy-metals, and the Water-hyacinths that fringe the ponds further absorb metallic ions. Reduction of coliform Bacteria is more than 99.9% in ponds that are well stocked with fish. Without this natural system of sewage purification, Calcutta would undoubtedly suffer grave environmental problems since it has no sewage

treatment plants. As it is, the wastes supply food for the City.

The Department of Fisheries research and monitoring project seeks to understand the wetlands in order to protect and extend the fisheries. It is hoped that the ecological knowledge gained can be applied to other cities in India and other parts of the world. Sewage wastes and fish are just the principal components of a complex system of plant and animal life. The long experience of the fisher-folk of Calcutta's wetlands indicates that this system works, though the details remain to be uncovered. Meanwhile, further information may be obtained from Dr Dhrubajyoti Ghosh, Calcutta Metropolitan Water and Sanitation Authority, 32 BBD Bag, South Calcutta 700001, India.

#### REFERENCE

GHOSH, Dhrubajyoti (1983). *Sewage Treatment Fisheries in East Calcutta Wetlands: Low-cost, Resource-conserving Option in Environmental Repair*. Project Report on Utilization of Calcutta's Sewage Government of West Bengal, Calcutta, India: 36 pp.

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